UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/596,553	06/16/2006	Wei Yuan	N1868_003	7836

23456   7590   11/14/2008
WADDEY & PATTERSON, P.C.
1600 DIVISION STREET, SUITE 500
NASHVILLE, TN 37203

EXAMINER
HAVAN, HUNG T

ART UNIT	PAPER NUMBER
4115	

NOTIFICATION DATE	DELIVERY MODE
11/14/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docket@IPLAWGROUP.COM
BFL@iplawgroup.com

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☐ Responsive to communication(s) filed on _____ .

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-56* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-56* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *16 June 2006* is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☒ All   b) ☐ Some * c) ☐ None of:

       1. ☐ Certified copies of the priority documents have been received.

       2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

       3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____ .

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____ .

DETAILED ACTION

Oath/Declaration

1.   Receipt is acknowledged of papers filed under 35 U.S.C. 119 (a)-(d) based on an

application filed in PCT on 12/20/2004. Applicant has not complied with the requirements of

37 CFR 1.63(c), since the oath, declaration or application data sheet does not acknowledge the

filing of any foreign application. A new oath, declaration or application data sheet is required in

the body of which the present application should be identified by application number and filing

date.

Drawings

2.   The drawings are objected to because figures 1-6 and 21-29 are blurred. In addition, the

term "PRIOR ART" should be recited in figures 3 and 4. Further, Fig. 13 is objected to because

it failed to show front faces that "form a watertight mesh and lie outside the geometry".

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office

action to avoid abandonment of the application. Any amended replacement drawing sheet should

include all of the figures appearing on the immediate prior version of the sheet, even if only one

figure is being amended. The figure or figure number of an amended drawing should not be

labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be

removed from the replacement sheet, and where necessary, the remaining figures must be

renumbered and appropriate changes made to the brief description of the several views of the

drawings for consistency. Additional replacement sheets may be necessary to show the

renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an

application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet"

pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will

be notified and informed of any required corrective action in the next Office action. The

objection to the drawings will not be held in abeyance.

Specification

3.   The disclosure is objected to because of the following informalities: The term "This

application claims the priority of PCT/US04/42910, filed December 20, 2004 which claims the

benefit of the US Provision Application Serial No. 60/531,380, filed December 19, 2003, and the

content of which are incorporated herein by reference in its entirety.--, so as to update the status.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the
> subject matter which the applicant regards as his invention.

5.   Claims 1-56 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for

failing to particularly point out and distinctly claim the subject matter which applicant regards as

the invention.

Regarding claims 1, 28, and 30, the term "a digital **or** visual representation" render the

claim indefinite because it is an alternate expression and is subject to more than one

interpretation. Finally, the antecedent basis for "all educational topics" (as per claim 7) and "the

educational program" (as per claims 7 and 9) has not been clearly set forth. In addition, it is

noted that without the needed step of generating a visual representation, the claim cannot

perform the function as claimed.

Regarding claim 26, the term "method of either claim 25 wherein" should be recited as --

method of claim 25 wherein--, so as to clarify the confusion.

Claims 2-25, 27, 29 and 31-56 are rejected for incorporating the above errors from their

respective parent claims by dependency.

Claim Rejections - 35 USC § 101

6.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or
> any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and
> requirements of this title.

7.   Claims 1-56 are rejected under 35 U.S.C. 101 because the claimed invention is directed

to non-statutory subject matter.

Regarding claims 1-27, the claimed steps thereof do not produce a useful, tangible, and

concrete result. They merely recite a software algorithm, per se, which, for example, does not

display, store, or otherwise provide a useful tangible output. Note exemplary claim 1 which only

recites software steps and does not produce a useful tangible and concrete final result. See

MPEP 2106. The digital representation is never realized outside of its abstraction to produce a

final result that is tangible. Furthermore, the invention, as claimed, is not drawn toward a

practical application. Accordingly, the claims are drawn to non-statutory subject matter.

Regarding claims 28-56, claimed the software program thereof are rejected because they

are drawn to computer programs per se. Functional descriptive material such as computer

programs and/or data structures not claimed as embodied in computer-readable media are

descriptive material per se and are not statutory because they are not capable of causing

functional change in the computer. Such claimed data structures do not define any structural and

functional interrelationships between the data structure and other claimed aspects of the

invention which permit the data structure's functionality to be realized." See MPEP 2106.01(I).

In the instant case, claim(s) do not meet the test above and therefore are rejected as non-statutory

subject matter.

Claim Rejections - 35 USC § 102

8.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on
> sale in this country, more than one year prior to the date of application for patent in the United States.

9.   Claims 1, 2, 4, 5, 7, 14, 15, 28-31, 33, 34, 36, 43 and 44 are rejected under 35

U.S.C. 102(b) as being anticipated by Beale (US Pat. No. 5,923,329).

Regarding claims 1, 28 and 30, Beale broadly discloses a method for generating a digital

or visual representation of a closed tessellated surface geometry (see Fig. 2 and col. 6, lines 42-

51, which discloses a method to generate a CAD model to be used for flow analysis. CAD model

is defined as surfaces of the object in the form of interior and/or exterior surfaces. It is well

known in the art that these surfaces must meet the requirement of being closed or watertight to

be used in flow analysis as confirmed by applicant in paragraph 5 of the specification)

comprising the steps of importing a geometric model into a model processor, the model having a

geometry defining a shape of the model (i.e. "A CAD model...is provided to a computer" and

the computer in this instant is used to process the CAD model and it is a model processor, see

col. 6, lines 42-51); generating a volume mesh around the imported geometric model (see col. 3

lines 17-20, which describes the same step and states that grids are also referred to as "cells",

"meshes", "elements" and so forth in col. 1, lines 47-50.); extracting a first mesh front that

encloses the model, the first mesh front comprising a closed mesh that generally conforms to

geometry of the model (i.e. an initial grid around a fish (i.e. geometry of a model) and the figure

shows a grid depicting a surface boundary (i.e. mesh front) of the fish, see Fig. 12i and col. 5,

lines 25-27); mapping the first mesh front onto the model geometry (i.e. the nodes of the current

grid with the reference grid containing the model, see col. 3, lines 32-40); and optimizing the

first mesh front, thereby creating a digital representation of a closed tessellated surface geometry

(i.e. iteratively performing the mapping step above until the residual associated with the nodes

are within predetermined tolerance level (i.e. optimization), see col. 3, lines 26-40).

Regarding claims 2, 29 and 31, Beale discloses the step of exporting the model from the

model processor (i.e. the step of "Output Model" in Fig. 2).

Regarding claims 4, 14, 33 and 43, Beale discloses the geometric model comprises a 2-D

model (Figs. 12f, 12i, and 12j for 2-D implementation, and col. 5, lines 25-30) and the geometric

model comprises a 3-D model (Figs. 12e and 12h for 3-D implementation, and col. 5 lines 19, 20

and 24).

Regarding claims 5, 15, 34, and 44, Beale discloses the volume mesh being comprised of

a plurality of 2-D cells or 3-D cells. Beale teaches that grids are known and have been used

extensively in design and analysis being also referred to as "cells", "meshes" "elements" and so

forth (col. 1, lines 48-50), generating a reference grid (col. 3, line 17) and shows that applies to

both 2-D (Figures 12f, 12i, and 12j) and 3-D (Figures 12e and 12h).

Regarding claims 7 and 36 Beale discloses the volume mesh is a 2-D Cartesian mesh

(col. 1, lines 59-65 and col. 2, lines 1-15).

Claim Rejections - 35 USC § 103

10.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459

(1966), that are applied for establishing a background for determining obviousness under 35

U.S.C. 103(a) are summarized as follows:

1.   Determining the scope and contents of the prior art.
2.   Ascertaining the differences between the prior art and the claims at issue.
3.   Resolving the level of ordinary skill in the pertinent art.
4.   Considering objective evidence present in the application indicating obviousness
        or nonobviousness.

11.   This application currently names joint inventors. In considering patentability of the

claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

claims was commonly owned at the time any inventions covered therein were made absent any

evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c)

and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12.   Claims 3 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beale

(US Pat. No. 5,923,329).

        Regarding claims 3 and 32, it is noted that Beale does not explicit disclose the model is

exported for a visual representation on a display screen. It is the Examiner position that

exporting of a model to a display screen is extremely well known in computer aided design.

Hence, it would have been obvious to one of ordinary skill in the art at the time the invention

was made to combine the features because this step allows the designer to further analysis or

modify the model to achieve desired results.

13.   Claims 6, 8, 9-13, 16-27, 35, 37-42 and 45-56 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Beale (US Pat. No. 5,923,329) further in view of Ross et al (US Pat. No.

6,608,628 B1).

        Regarding claims 6, 16, 35 and 45, Beale teaches generating a volume mesh (see col. 3,

lines 17-20), but fails to teach generating a 2-D or 3-D bounding box around the geometry and

then filling the bounding box with a volume mesh. However, Ross et al teaches the display cube

representing volumetric data and x, y, z planes (401 of Fig. 4) essentially a 3-D bounding box for

the geometric model. Ross et al. also teaches the use of three planes corresponding to the x, y,

and z planes of the data volume (see col. 7, lines 1 and 2). The planes constrained by the 3-D

volume box effectively making them 2-D bounding boxes as opposed to infinite mathematical

planes.   Hence, it would have been obvious to one of ordinary skill in the art at the time

invention was made to combine the volumetric data disclosed in Ross et al. with the mesh

generation disclosed in Beale for the purpose of analyzing fluid mechanics using numerical

calculations on a digital computer (col. 1, lines 43-48 of Beale).

Regarding claims 8, 18, 37, and 47, it is noted that Beale fails to teach the first mesh front

comprises at least one collection of plurality of faces. Fig. 6 of Ross et al and col. 7, lines 28-34

discloses that initially, at block 601 the points that constitute the above-noted boundary are

connected into a triangle-based mesh using the marching cubes algorithm. The marching cubes

algorithm produces a mesh consisting of a mixture of polygon shapes. However, the mesher 24

performs additional operations to produce a more regular, triangle-based mesh from the

marching cubes generalized polygon mesh. Furthermore, Ross et al recites that all triangles with

no area (i.e., triangles for which two or more vertices lie on top of one another) are eliminated -

this step prevents tearing (occurrence of holes) (col. 7, lines 44-49). In other words, the

marching cube algorithm extracts a mesh front and the additional operations ensure the mesh

front meets the closed requirement.

Regarding claims 9, 19, 38 and 48,it is noted that Beale fails to teach the step of

extracting a first mesh front includes identifying and discarding all cells that intersect the

geometry of the model, thereby defining a first collection of cells positioned inside the geometry

and a second collection of cells positioned outside the geometry, discarding one of the first or the

second collection of cells, thereby defining at least one hole in the volume mesh, the hole

enclosing a part in the geometric model, and identifying hole boundaries associated with the hole

and grouping the hole boundaries into a collection of faces, the collection of faces defining a

mesh front. However, Ross et al teaches that extraction of a mesh front by having the user select

a threshold value to identify the pixels (for 2-D models)/voxels (for 3-D models) inside and

outside of the geometric model (see col. 7, lines 6-24).

Regarding claims 10, 21, 39, and 50, Beale teaches mapping the mesh front onto the

model geometry comprises eliminating sharp corners from the mesh front, and smoothing the

mesh front (Beale column 2 lines 16 to 19), but fails to teach eliminating sharp corners from the

mesh front. Ross et al discloses "mesh reduction can alternatively be performed as a reduction in

the number of vertices based on minimization of the local mesh curvature" (see col. 8, lines 43-

45).

Regarding claims 11, 22, 40, and 51, Beale teaches mapping the mesh front onto the

model geometry further comprises projecting mesh vertices directly onto the geometry (col. 3,

lines 32-40).

Regarding claims 12, 23, 41, and 52, Beale teaches optimizing the mesh front includes

smoothing the vertices (col. 2, line 18) and re-projecting the vertices onto the geometry (col. 3,

lines 31-40). Beale iteratively modifies coordinates of the current grid so that for each node with

an associated scalar of the original model is within predetermined tolerances.

Regarding claims 13, 24, 42, and 53, it is noted that Beale fails to teach optimizing the

mesh front includes combining faces. However, Ross et al discloses that mesh reduction can

alternatively be performed as a reduction in the number of vertices based on minimization of the

local mesh curvature. Removal of vertices results in combining faces as admitted by applicant

(see paragraph [0062] of the specification).

Regarding claims 17 and 46, Fig. 12h of Beale teaches the volume mesh is a 3-D

Cartesian mesh (see col. 1, lines 59-65 and col. 2, lines 1-15).

Regarding claims 20 and 49, it is noted that Beale fails to teach extracting a first mesh front further comprises identifying polygonal front faces and splitting the polygonal front faces into triangular or quadrilateral front faces. However Ross et al discloses that dividing the polygons have more than three sides into groups of connected triangles at block 602. Hence, the mesher 24 closely approximates small changes in curvature of the object as it re-generates the mesh (col. 7, lines 36-40).

Regarding claims 25 and 54, Beale teaches smoothing the mesh front comprises multiple smoothing passes (col. 3, lines 27-40).

Regarding claims 26 and 55, Beale discloses that smoothing the mesh front further comprises using a Laplacian smoothing algorithm is known to one of ordinary skill in the arts at the time of invention (col. 2, lines 16-46).

Regarding claims 27 and 56, Beale teaches smoothing pass comprises projecting each mesh vertex onto the geometry of the model using a closest point projection (col. 3, lines 37-40) because altering a location of the associated node to reduce the residual by modifying coordinates of the current grid reads on the claims when the residual tolerance is zero.

Conclusion

14.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Loop (US Pat. No. 5,602,979) discloses method for generating smooth surfaces over irregular meshes using low degree parametric polynomial representation.

Deering (US Pat. No. 6,459429 B1) discloses methods to compress 3-D data for

transmission via multicast/unicast channels.

Celniker (US Pat. No. 6,256,603 B1) discloses methods to simulate continuous

geological surface areas using finite element mesh.

15.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to HUNG HAVAN whose telephone number is (571)270-7864.

The examiner can normally be reached on Monday thru Thursday, 7:30 AM - 5:00 PM, Alternate

Fridays, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Joe Cheng can be reached on (571)272-4433. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

like assistance from a USPTO Customer Service Representative or access to the automated

information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/H. H./   /Joe H Cheng/
Examiner, Art Unit 4115   Supervisory Patent Examiner
11/04/2008   Art Unit 4115